MINERAL INFORMATION SERVICE

STATE OF CALIFORNIA — DIVISION OF MINES

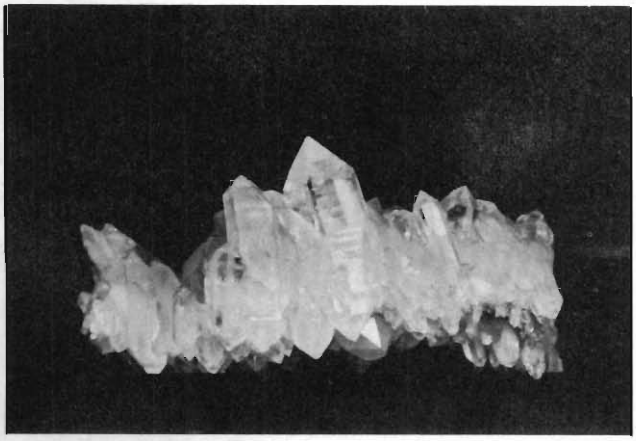
Volume 12 Number 4

APRIL 1959

QUARTZ FAMILY MINERALS

When primitive man first began to use minerals for adornment and for tools, the raw materials he picked up were mostly varieties of quartz. A nicely-proportioned quartz crystal or a brightly-colored pebble of jasper is too beautiful and curious an object to be ignored by most men, and such materials were collected in early times as charmstones. But many thousands of years before the dawn of history, an inventive primitive discovered that some abundant varieties of quartz, such as flint, are easily flaked to form sharp weapons and other useful implements. Thus was initiated the first mineral industry.

The quartz family includes those minerals composed of silica (silicon dioxide); specifically these are quartz, tridymite, and cristobalite, as well as opal, a non-crystalline substance composed of silica and water. However, numerous varietal names, both colorful and descriptive, are used for quartz according to the appearance of the crystals, the grain size, and colors and patterns caused by various impurities. Many of these technically are rocks rather than minerals because they refer to aggregates of minerals; but they have persisted in the literature as mineral varieties, much to the confusion of both scientists and laymen. The lack of systematic nomenclature derives partly from the fact that many of the materials are semi-precious gem stones, and acquired names and mineral recognition long before the advent of systematic mineralogy.



Cluster of colorless quartz crystals.

Quartz

Although simple in composition, quartz is possibly the most complex mineral in the variety of its appearances and modes of occurrence. Being the most abundant mineral in the crust of the earth, it is present in almost every locality in one form or another. Quartz is most conveniently classified into two types, phanerocrystalline and cryptocrystalline. The first type occurs as crystal masses sufficiently large to be analyzed with the unaided eye or with ordinary optical aids such as the hand lens or microscope, although this does not imply that crystal faces need be present. The term cryptocrystalline is applied to mineral materials that are so finely crystalline that this fact can only be recognized under the microscope by using polarized light, but individual crystals are too small to be analyzed even by this means.

Phanerocrystalline Varieties of Quartz

Quartz crystallizes in the hexagonal system. The phanerocrystalline varieties have a vitreous luster and prominent conchoidal fracture; they ordinarily lack evidence of cleavage, although incipient cleavages are present but rarely are prominent. The hardness is 7 (Mohs' scale), and the specific gravity of the pure mineral is 2.653 to 2.660. Quartz has strong resistance to attack by weathering and most acids. These characteristics account in part for its tendency to be abundant in outcrops and to be a prominent residual material in soils and sediments, and are also among the desirable qualities of good lapidary materials.

Typical quartz crystals are hexagonal prisms terminated by 6-sided pyramids, the latter being formed from the combination of faces from two different rhombohedral forms. The prism faces are commonly striated perpendicular to the prism axis. However, the crystal faces develop only in special environments such as rock cavities and phenocrysts in certain porphyritic igneous rocks. Most quartz occurs as disseminated irregular grains in many different types of rocks or as massive aggregates of irregular grains, such as milky vein quartz, that do not exhibit crystal faces.

Of particular geological interest are two modifications of the mineral known as alpha- and beta-quartz,